

# **Alliance Comments on Predictive Model Issues**

ARB Fuels Workshop

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# Intro

- WSPA issue: S-NOx response
  - Is the current draft model reasonable?
  - Sound science?
  - AIR analysis
- WSPA issue: T50/T90 responses
- Alliance Bottom Line

# What Sulfur Levels are Important?

- Past S levels: approx 20 ppm avg since late 90s
- Recent S levels: approx 10 ppm avg since 2004
- 2006 S range: 7-19 ppm (Alliance Fuel Survey, 2006 Summer LA and SF)
- Future S limit: proposed new cap = 20 ppm
- In 2010, most California Tech 5 vehicles will have seen only S << 30 ppm
- Why look at higher S data (for Tech 5)?

# Decision: Select Data Based on S

- Are we cherry picking test data?
  - No
- Are we cherry picking the *sulfur* levels?
  - Absolutely: 100-600 ppm S levels are 5x-30x higher than the highest S level of interest
- Data above ~35 ppm not relevant for Tech 5
- High S data skew impacts at low S
  - For very low-emitting Tech 5 vehicles, catalysts are more sensitive to S effects
- *Should* exclude high S data when determining Tech 5 responses

# Approach

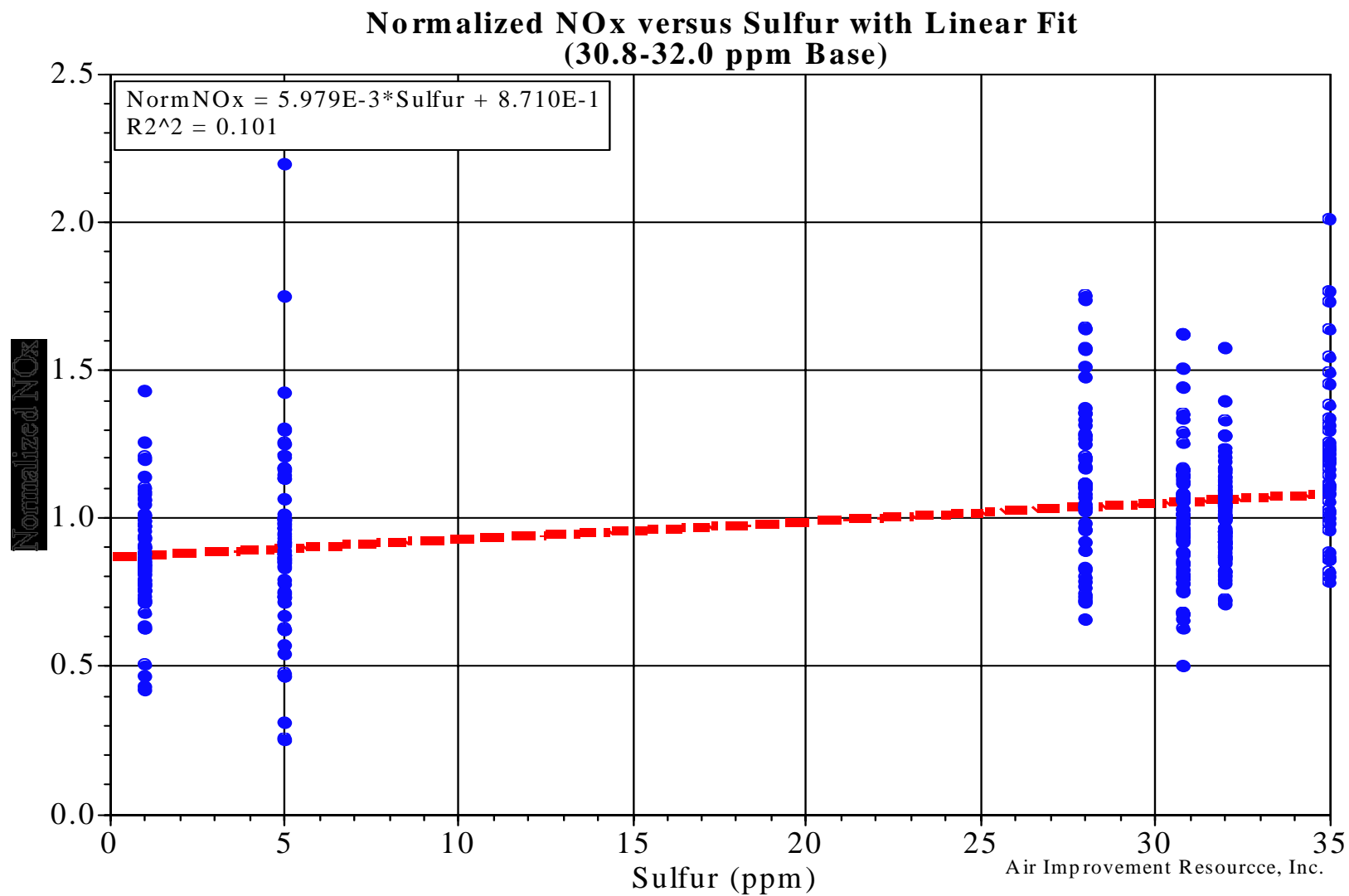
- Which data are for  $S < 40$  ppm?
- Does the study have at least 2 low sulfur data points?
- Enough vehicles?
- Enough data?

# Tech 5 Vehicle Sulfur Studies

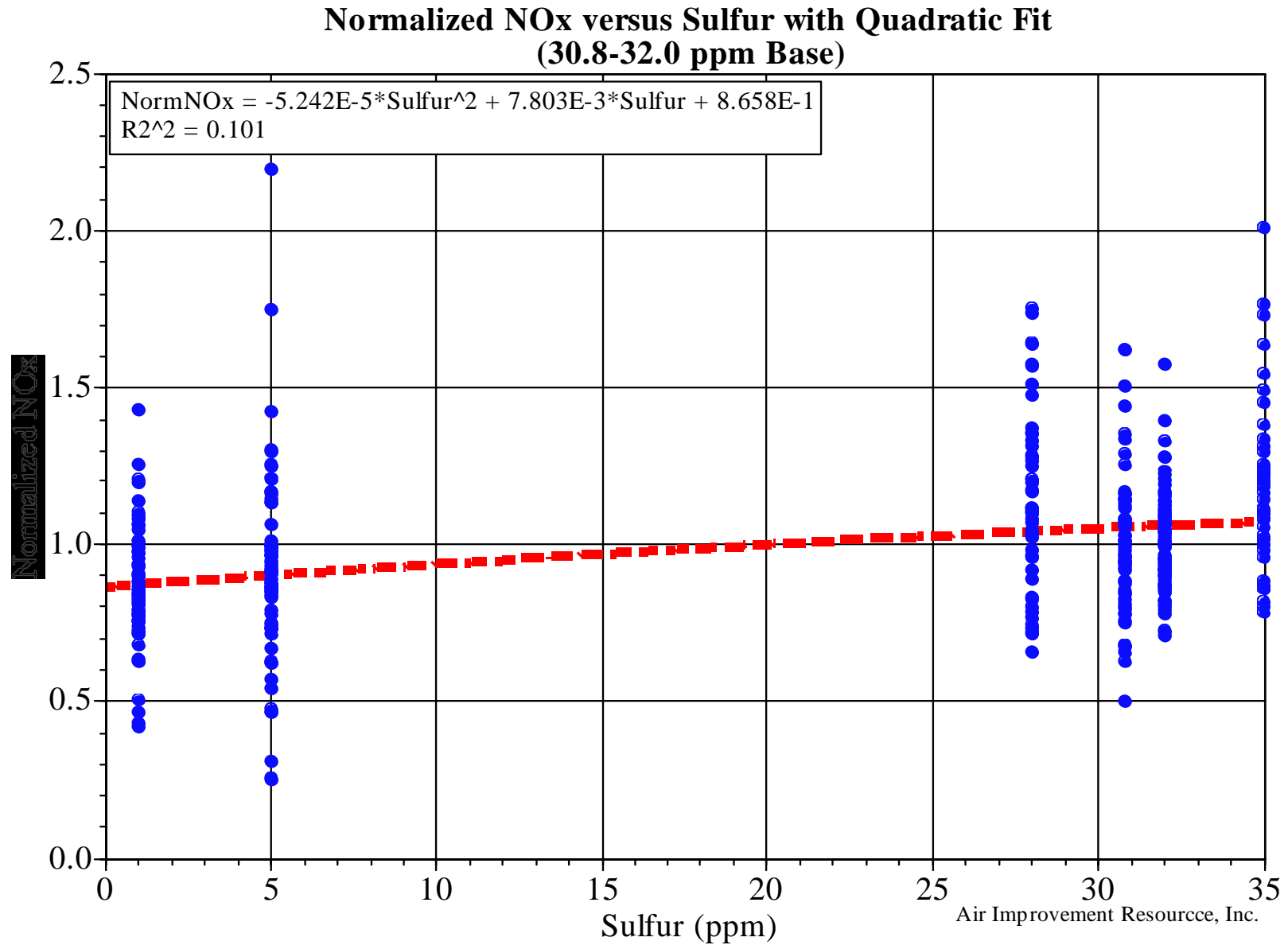
Study	# Vehicles	Model Years	Sulfur Levels
AAMALOSU	21	1997, 1999	40, 100, 150, 330, 600
AAMSUOXY	13	N/A	1, 28, 32, 35, 98
CRCLOSUL	12 (24)	1997	30, 100, 150, 331, 630
CRCLOSUOXY	12 (24)	1997	27, 148
CRCE60	14	2000, 2001	5, 31, 145

# Approach, cont.

- Choose AAMSUOXY and CRCE60
  - 27 vehicles: sufficient
  - 6 sulfur levels: 1, 5, 28, 31, 32, 35
  - Compare: 3 of WSPA's 5 “two lowest S fuels” were for much higher sulfur (28, 31, 100, 100, 148)
- Normalize NOx emissions for each study
  - Average the NOx emissions at the “high” S data points
  - Divide all NOx data—at both high and low S—by average
- Apply linear and quadratic fits
  - Gap between 6 ppm and 27 ppm not important
  - Quad looks linear because data cluster at both ends







# **NO<sub>x</sub> Reductions**

## **20 ppm → 10 ppm**

<b>Analysis</b>	<b>NO<sub>x</sub> Reduction</b>
AIR - Linear	6%
AIR - Quad	7.5%
ARB	7.5%
WSPA	3.6%

# Conclusion

- Current model's S-NOx response for Tech 5 appears reasonable

## 2d Issue: T50/T90-HC Responses

- WSPA asserts emissions response should be flat below  $T_{50}=190^{\circ}\text{F}$  and  $T_{90}=290^{\circ}\text{F}$
- For the record: Alliance believes the Toyota data (showing parabolic response)
  - Consistent with vehicle behavior
- But we think refiners are unlikely to produce fuels in that low range

# Alliance Bottom Line

- ARB Process: transparent, responsive, did good job identifying and addressing issues
- Draft Predictive Model looks reasonable
- Alliance believes it represents sound science
- We still believe ARB should cap S at 10 ppm
  - Refiners will be there, anyway
  - Would help enable fuel efficient lean burn gasoline engines
  - This model needs to be forward looking
  - Japan and EU already there (10 ppm)
  - California should lead way, or at least, not fall behind